Tle

# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/960,757 | 09/21/2001 | Joseph Thomas Woods | 08EB03119 (GP2-0201) | 6308 |

23413 7590 03/01/2005

CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

| EXAMINER | |
|---|---|
| HOGAN, MARY C | |
| **ART UNIT** | **PAPER NUMBER** |
| 2123 | |

DATE MAILED: 03/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/960,757 | WOODS ET AL. |
| | Examiner | Art Unit |
| | Mary C Hogan | 2123 |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *21 September 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-12,14-19,21-27,29 and 30* is/are rejected.

7)☒ Claim(s) *9,13,20 and 28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/26/01*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

1. **Claims 1- 30** have been examined.

### *Claim Objections*

2. **Claims 3, 12 and 16** are objected to because of the following informalities. Appropriate correction is required.

3. **Claims 3 and 16:** a space is needed: "1,wherein", "16,wherein".

4. **Claim 12:** there are two periods at the end of the claim.

### *Allowable Subject Matter*

5. **Claims 9, 13, 20 and 28** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. **Claims 1-8, 10-12, 16-19, 21-27, 29 and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Przybylo et al ("Experimental Investigations and Numerical Modeling of Incompressible Elastomers During Non-Homogeneous Deformations", Rubber Chemistry and Technology, September/October 1998, pages 730-749), herein referred to as **Przybylo,** in view of Trantina et al ("Standard Test Procedures for Relevant Material Properties for Structural Analysis" ANTEC 1998: Plastics, Plastics on My Mind, Volume 3), herein referred to as **Trantina**, and further in view of Srinivsan et al (U.S. Patent Number 6,610,408), herein referred to as **Srinivsan.**

9. As to **Claims 1, 16, and 23, Przybylo** teaches an applications server coupled to said mechanical testing machine, said applications server being configured to: apply physical properties of the material to a constitutive model (Introduction, first paragraph last two sentences; page 740, "Finite Element Models" first 3 sentences); perform bixial tests using a mechanical testing machine on the material shaped according to test geometries (page 732, paragraph 1, description of the Ogden model); receive data from the performance of the biaxial property tests (page 744, "Shear Results", first 2 sentences wherein the Ogden models use parameters determined from biaxial tests); determine failure mode as a function of strain rate (page 735, "Equipment", paragraph 1, sentence 3); perform finite element simulation analysis on the test geometries using the constitutive model (Introduction, first paragraph last two sentences, page 740, "Finite Element Models" first 3 sentences) for simulating the response of vinyl elastomers in large, non-homogeneous deformation states (Abstract).

10. **Przybylo** does not expressly teach determining the failure mode as a function of temperature, determining maximum principal stress levels from the finite element simulation analysis corresponding to experimental failure displacements obtained from the biaxial property tests that failed in a brittle failure mode (determining brittle failure criteria); applying the maximum principal stress levels (applying brittle failure criteria) and the constitutive model to finite element simulation analysis of the article.

11. **Trantina** teaches determining the failure mode as a function of temperature ("Ductile-Brittle Impact", paragraph 2), determining maximum principal stress levels corresponding to experimental failure displacements obtained from property tests that failed in a brittle failure mode ("Ductile-Brittle Impact", paragraph 3) in predicting the structural performance of actual molded parts using material such as thermoplastic (Introduction, sentence 2). Further, **Trantina** teaches finite-element structural analysis techniques can be used when the stress-strain curve is highly non-linear or the part geometry is complex ("Time and Temperature Dependent Deformation", last paragraph, last 2 sentences).

12. **Przybylo** and **Trantina** are both directed to the structural performance of plastic type materials with regard to stress and strain, and **Trantina** teaches that finite element structural analysis can be used

when the stress-strain curve is highly non-linear or the part geometry is complex. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the property tests to determine constitutive model components for the finite element simulations as taught by **Przybylo** could be modified to perform property tests to determine a failure mode as a function of temperature and to determine maximum principle stress levels corresponding to experimental failure displacements as taught in **Trantina** and to further apply these maximum principle stress levels to a constitutive model as taught in **Przybylo** since **Trantina** teaches that engineers must be able to predict structural performance of materials (Introduction) and finite element analysis as taught in **Przybylo** is a method used for such predictions for similar materials (Introduction, first paragraph).

13. **Przybylo** does not expressly teach wherein the sample is a painted sample.

14. **Srinivsan** teaches the use of thermoplastic polyolefin blends ("TPO" blends) which include a multimodal elastomer that are used in automobile parts, equipment housings, toys and the like wherein it is desirable to paint such components for aesthetic or functional purposes (column 1, lines 5-18) and further teaches that these TPO blends have excellent paintability, a broad range of stiffness values as well as high impact and tensile strengths which make them suitable for automotive applications (column 6, lines 47-50).

15. It would have been obvious to one of ordinary skill in the art at the time the invention was made that the elastomer samples tested according to uniaxial and biaxial tests as taught in **Przybylo** could be painted samples since it is known in the art that elastomers are included in blends used for automobile parts, equipment housings, toys and the like wherein it is desirable to paint such components for aesthetic or functional purposes (column 1, lines 5-18).

16. As to **Claims 2, 17 and 24, Przybylo, Trantina** and **Srinivsan**, herein referred to as **PTS**, teach: wherein said constitutive model characterizes deformation behavior of the material with respect to strain rate, temperature, and stress behavior (**Przybylo**: page 735, "Equipment", paragraph 1, sentence 3; page 736, paragraph 1, last sentence; Figures 10 and 11; **Trantina**: "Ductile-Brittle Impact", paragraph 2, Figures 2-4).

17. As to **Claims 3 and 18 and 25, PTS** teach: wherein said biaxial property tests are performed at a practical range of service conditions of the article (**Przybylo**: page 732, first 2 paragraphs).

18. As to **Claim 4, PTS** teach: wherein said applying includes: determining maximum principal stress levels for one or more strain rates and averaging said maximum principal stress levels at each of said one or more strain rates (**Trantina**: "Ductile-Brittle Impact", paragraph 3, Figure 4).

19. As to **Claim 5, PTS** teach: wherein said applying includes: determining maximum principal stress levels for one or more temperatures and averaging said maximum principal stress levels at each of said one or more temperatures (**Trantina**, "Ductile-Brittle Impact", paragraph 2, sentence 3, paragraph 3, last 2 sentences; Figure 4; "Time and Temperature Dependent Deformation" paragraphs 7 and 8).

20. As to **Claim 6, PTS** teach: wherein said applying includes: determining maximum principal stress levels for one or more strain rates and determining the lower bound of said maximum principal stress levels at each of said one or more strain rates (**Trantina**: "Ductile-Brittle Impact", paragraph 3, wherein the maximum principle stress level is kept below those required to initiate failure, or a "lower bound").

21. As to **Claim 7, PTS** teach: wherein said applying includes: determining maximum principal stress levels for one or more temperatures and determining the lower bound of said maximum principal stress levels at each of said one or more temperatures (**Trantina**, "Ductile-Brittle Impact", paragraph 3, wherein the maximum principle stress level is kept below those required to initiate failure, or a "lower bound").

22. As to **Claims 8, 19 and 27, PTS** teach: validating the constitutive model by comparing analytical load-displacement response from the finite element simulation analysis using the constitutive model with the experimental load-displacement results obtained from said biaxial property test (**Przybylo**: Introduction, last paragraph; page 732, paragraph 1; page 744 "Shear Results", sentences 1-2 wherein the Ogden constants are chosen from a series of biaxial extension tests).

23. As to **Claims 10, 21 and 29, PTS** teach: determining the physical properties of the material using a tension test and a compression test performed by a mechanical testing machine and said application server determines the physical properties of the material using data from the tension and compression tests (**Przybylo**: page 733, "Experimental Procedures", first paragraph).

24. As to **Claims 11, 22 and 30, PTS** teach: wherein said determining the physical properties includes: said mechanical testing machine comparing tensile and compressive yield stresses at the same rate to determine a pressure dependent material parameter and inputting said pressure dependent material parameter into the constitutive model (**Trantina**: "Ductile-Brittle Impact, paragraph 3, "geometric severity ratio" and "strength ratio" and descriptions; "Time and Temperature Dependent Deformation", last paragraph, last 3 sentences).

25. As to **Claim 12, PTS** teach: wherein said applying includes: inputting the maximum principal stress levels and the constitutive model into a user subroutine (**Przybylo**: Introduction, paragraph 3, first sentence; page 740, first 3 sentences; **Trantina**: "Time and Temperature Dependent Deformation", last

paragraph, last 3 sentences), the user subroutine setting a stiffness matrix for an element in a finite element module to zero when the stress level in the element is calculated to exceed the maximum principal stress levels (**Przybylo**: "Stability Criteria", first paragraph).

26. As to **Claim 26, PTS** teach: wherein the failure criteria includes ductile and brittle failure criteria (**Trantina**: "Ductile-Brittle Impact", paragraph 2; "Conclusions", "To predict ductile/brittle behavior of parts geometry can be captured with a geometric severity factor and compared to the strength ratio-the material's critical maximum principal stress at the appropriate strain rate and temperature divided by the yield stress.").

27. **Claims 14 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Przybylo** in view of **Trantina**.

28. As to **Claim 14, Przybylo** teaches: a method for predicting impact properties of an article, wherein the method incorporates biaxial property tests determined under a practical range of service conditions in finite element simulations of test geometries (page 732, paragraph 1; page 744, "Shear Results", sentences 1-2).

29. **Przybylo** does not expressly teach wherein brittle failure criteria are obtained.

30. As to **Claim 15, Przybylo** teaches: a method for determining failure criteria wherein the method comprises: obtaining deformation model parameters (Introduction, paragraph 3, first sentence; page 740, first paragraph, sentence 3); performing property tests under varying rates and recording load displacements (page 735, "Equipment", paragraph 1, sentence 2; page 736, first paragraph, last 2 sentences); using deformation model parameters in a finite element input deck and post yield data in a user material subroutine (page 740, first paragraph, sentences 1-3; Figures 10-12 wherein the data are plotted as a result of the simulations); selecting analysis displacement and time to approximate test failure displacement and displacement rate (page 735, "Equipment", paragraph 1, sentences 1-3 wherein the simulations are run over a time specified by the user running the simulation);

31. **Przybylo** does not expressly teach performing property tests under varying temperatures; determining failure displacements for test conditions employed in said performing property tests; and obtaining maximum principal stress for brittle failure.

32. **Trantina** teaches performing property tests under varying temperatures and determining failure displacements for test conditions employed in said performing property tests ("Introduction, paragraph 1, sentence 6; "Ductile-Brittle Impact, paragraph 2, sentence 3) and obtaining maximum principal stress for brittle failure (brittle failure criteria) ("Ductile-Brittle Impact, paragraph 3) for thermoplastic material and

teaches that as thermoplastics are used more in load-bearing designs, engineers must be able to predict the structural performance of actual molded parts (Introduction, sentence 2). Further, **Trantina** teaches methods to predict brittle failure of thermoplastic parts since no simple methods are known in the art wherein this testing includes testing the load-displacement response over various loading rates and temperatures ("Ductile-Brittle Impact", paragraphs 1-2) and that finite element analysis can be used when the isochronous stress-strain curve is highly non-linear or the part geometry is complex, then, the complete nonlinear, isochronous stress-strain curve can be used in a nonlinear finite element analysis ("Time and Temperature Dependent Deformation", last paragraph).

33. It would have been obvious to one of ordinary skill in the art to modify the finite element analysis simulations for load displacements for elastomer materials as taught by **Przybylo** to perform analysis on the load-displacement response wherein testing is performed over various temperatures and performed to determine maximum principle stress for brittle failure in thermoplastics as taught in **Trantina** since **Trantina** teaches that engineers must be able to predict the structural performance of thermoplastic materials wherein a finite element analysis can be used to predict the structural performance ("Time and Temperature Dependent Deformation", last paragraph).

***Conclusion***

34. The prior art made of record, see PTO 892, and not relied upon is considered pertinent to applicant's disclosure, careful consideration must be given prior to Applicant's response to this Office Action.

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary C Hogan whose telephone number is 571-272-3712. The examiner can normally be reached on 7:30AM-5PM Monday-Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary C Hogan

Examiner

Art Unit 2123

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER